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The Clinical Significance of the Hydrogen-ion Concentration of the Semen of the Bull

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The widespread application of artificial insemination has done much within recent years to focus attention on the semen quality of the domesticated animals. The commoner methods of evaluating semen include the measurement of the degree of motility, the concentration of spermatozoa and the number of abnormal forms. Using these methods it is usually possible without much difficulty to distinguish fertile and sterile bulls. Apart, however, from the respiratory rate of spermatozoa which has been found to give a better indication of fertility than any other single measurement (Edwards and Walton, 1939), the best evaluation of semen that can be made at present is that which includes all these methods. None of these criteria, however, is adequate to determine small differences in fertility (Milovanov, 1936; Edwards and Walton, 1939; Anderson, 1941).

From recent work on the hydrogen-ion concentration of bull semen it appears that this measurement may be of considerable practical value. The semen of the bull is usually acid in reaction (Milovanov, 1934; Sergin, 1935; Hatziolos, 1937; Davis and Williams, 1939; Anderson, 1942). In 221 ejaculates of clinically normal bulls the mean *p*H was 6·73+0·020 (Anderson, 1942). The range in *p*H of the semen of 11 fertile bulls was from 6·36 to 7·61 and significant individual differences were noted. A significant inverse relationship between the *p*H of ejaculates and (*a*) the number of spermatozoa per c.mm. (Schneerson, 1936; Davis and Williams, 1939; Anderson, 1942) and (*b*) the volume of ejaculates and motility of spermatozoa (Davis and Williams, 1939; Anderson, 1942) has been noted, *i.e.*, the more acid the semen, the larger the volume of the ejaculate, the higher the motility and the greater the concentration of spermatozoa. In a few instances abnormal ejaculates have occasionally been obtained from fertile bulls which consisted only of seminal fluid, spermatozoa being completely absent; such ejaculates were alkaline. Typical ejaculates from these bulls containing a normal concentration of spermatozoa were acid. Exceptions to this inverse relationship have, however, been noted. Of the 221 ejaculates, 12 ejaculates had a *p*H in the range 6·31-6·90 associated with a mean motility of 38 per cent. and a mean number of spermatozoa of 274,000 per c.mm. and 22 ejaculates had a *p*H of 6·91-7·20 associated with a mean motility of 78 per cent. and a mean number of spermatozoa of 436,000 per c.mm. The highest *p*H—7·60—with which a good motility (70 per cent.) has been obtained occurred in an ejaculate with a concentration of 260,000 spermatozoa per c.mm. In this instance the motility was unduly high for the concentration of spermatozoa and the *p*H. It is generally recognised that while motility is essential for fertility it is not a proof of fertilising capacity. Some ejaculates, for example, although of good motility, may contain a high number of abnormal spermatozoa. The author has found that ejaculates of high motility, 90-100 per cent., may vary in their *p*H from 6·38-7·20, and this observation is of some importance for differentiating ejaculates which hitherto would have been regarded as of almost equal value. The determination of both motility and *p*H, as Davis and Williams (1939) have shown, should form a sound basis for evaluation of semen.

It is the object of this paper to present the results of *p*H determinations of the semen of sterile bulls. The methods used for collecting semen and estimating the degree of motility and concentration of spermatozoa have already been given (Anderson, 1940). The *p*H was determined with a glass electrode (Beckman *p*H meter).

RESULTS

The mean *p*H of 30 ejaculates from 15 bulls with epididymitis was 7·618±0·070 (s = 0·390) with a range of 6·53-8·39. Typically the semen of bulls with epididymitis contains either no spermatozoa or few spermatozoa which are either lifeless or show feeble activity. In unilateral, as well as bilateral epididymitis this type of ejaculate has always been obtained, but recently two bulls with chronic unilateral epididymitis have been observed which ejaculated semen of good motility and of a low *p*H. Omitting these two cases, the range of the *p*H of semen of typical cases of epididymitis was from 6·75-8·39. Only about 6 per cent. of ejaculates from bulls with epididymitis had a *p*H lower than 7·00. In correspondence with the alkaline reaction, spermatozoa were absent from 39 out of a total of 47 ejaculates. In four typical cases in which spermatozoa were present the concentration was from 20,000-40,000 per c.mm. One of the bulls with atypical epididymitis whose semen was acid and showed high motility (90 per cent.) had counts of 530,000 and 770,000 per c.mm. The *p*H of ejaculates collected successively from typical cases of epididymitis became increasingly alkaline, *e.g.*, 1st ejaculate 7·02, 2nd ejaculate 7·59 and 3rd ejaculate 7·78. In addition to the ejaculates the *p*H of which was accurately determined with the glass electrode, 17 other ejaculates from three other bulls had a *p*H of approximately 7·00-8·00 when tested with B.D.H. Universal Indicator. An alkaline reaction was thus characteristic of the semen of typical cases of epididymitis. Two bulls, Nos. 2 and 12, when tested in September, 1940, ejaculated alkaline mucoid semen containing no spermatozoa; these bulls showed clinically signs of epididymitis in December, 1940, and February, 1941, respectively.

Six ejaculates from three bulls with small testes had a mean *p*H of 7·73, range 7·01-8·02. First ejaculates had a *p*H of 7·68 and second ejaculates 7·85. Spermatozoa were absent from the ejaculates.

One bull (SK) which has been described previously (Anderson, 1941) has enlarged and rounded testes and lately the scrotum has become very relaxed and the testes hang very low. This bull has been consistently a bad or indifferent sperm producer over a period of years. In the previous series of ejaculates the concentration of spermatozoa was rather below normal, the motility definitely subnormal, the abnormal types of spermatozoa somewhat too numerous and the volume of ejaculates larger than normal. The *p*H of 18 subsequent ejaculates from this bull was 6·94 which is higher than that obtained from normal bulls. The general sperm picture was somewhat better than in the previous series, motility 72 per cent. (range 40-90 per cent.), concentration 1,163,000 per c.mm., and volume 5·4 ml. The best motility obtained from this bull was 90 per cent. with a *p*H of 7·01.

Another bull, a pure-bred Friesian, had testes not unlike those of the above bull in appearance, but the type of semen produced was much poorer. Fifteen ejaculates from this bull had a *p*H of 6·90 or higher, the motility varied from nil to 60 per cent. and the concentration from 20,000-440,000 per c.mm.

Three bulls which clinically appeared to have normal testes and epididymes were bad sperm producers. Although they were in herds affected by vaginitis-cervicitis and epididymitis, they have shown no clinical signs of epididymitis over a period of fully a year. The *p*H of the semen of one of these bulls ranged from 6·95-7·13 (5 ejaculates); of 4 ejaculates from the second bull *p*H was from 7·61-8·20, and of 2 ejaculates from the third bull *p*H was 7·40 and 7·48. The average motility of semen of these bulls was 30 per cent., and the *p*H of first ejaculate was 7·19 and of second ejaculate 7·38.

DISCUSSION

From the inverse relationship that exists between the *p*H of semen, and concentration and motility of spermatozoa and the volume of ejaculates, in that the more alkaline the *p*H the smaller the concentration of spermatozoa, the less the motility and the smaller the volume of the ejaculate, it is to be expected that the semen of sterile bulls which contains either no spermatozoa or few spermatozoa of feeble or no activity would have a higher *p*H than the semen of normal bulls and this has proved to be so, for characteristically the semen of fertile bulls has an acid reaction and the semen of sterile bulls an alkaline reaction. It has been noted that the reaction of the semen became neutral or alkaline in sterile rams (Webster, 1934-1935; McKenzie and Berliner, 1937) and Webster (1938) found that distinctly acid ejaculates were of high fertility and that as the degree of acidity decreased towards the neutral point so did the fertility. Webster (1938) also noted a similar correlation between the *p*H and fertility in the bull and suggested tentatively that the probable fertile *p*H range is from 6·00-7·5, with samples between 7·0 and 7·5 of very doubtful low fertility.

The cause of the alkalinity of the semen in sterile animals is not definitely known, but it is associated with a decrease in the concentration of spermatozoa or absence of spermatozoa. Increasing

the temperature of the scrotum in the ram caused the semen to become alkaline (Gunn, 1936; McKenzie and Berliner, 1937) and the change in *p*H was apparently due to the decrease in the number of spermatozoa since the semen after this heat treatment became thin and watery. Milovanov (1934) stated that with an increase in the amount of the accessory secretions the reaction of the semen became neutral or even alkaline, 7·0-7·5. Davis (1938) found that the *p*H varied widely as between semen collected by massage of the ampullae and seminal vesicles and by the artificial vagina; by the former method which yields a relatively greater amount of accessory secretions, a *p*H of 7·5-8·0 was not uncommon, while for the latter method the *p*H was ordinarily below 7·0. Davis also stated that massage samples tended to have a lower concentration of spermatozoa than samples collected with the artificial vagina. The *p*H of the epididymal contents is about 6·5 (Milovanov, 1934).

A reduction of the acid epididymal fraction or a relatively large amount of accessory gland secretion would reduce the acidity of the whole ejaculate. Both these causes may operate in sterile bulls, but since on the whole there is a greater change in the concentration of the spermatozoa than in the volume of the ejaculate in sterile bulls, the increased alkalinity of the semen of sterile bulls appears more likely to be due to a reduction in the epididymal fraction. Whether or not the acidity of the epididymis is due to the presence of spermatozoa or to the functional condition of the secretory glands of the epididymis remains to be decided. The association between acidity and concentration and motility of spermatozoa, however, opens the way to considering measures for improving the quality of the semen.

The production of spermatozoa had either ceased in the bulls with small testes or the absence of spermatozoa may have been due to occlusion of the epididymal ducts—this, however, is unlikely as both testes were small and the epididymes showed no clinical signs of chronic changes. The alkaline reaction of the ejaculates from these bulls may have been due to the absence of spermatozoa or perhaps to an alteration in function of the accessory reproductive organs due to depressed hormonal testicular secretion. In epididymitis a similar explanation may serve for the alkalinity of the semen with a third possibility that the chronic inflammatory changes in the genital tract may have been involved. The spermatogenetic function of the testes of the Ayrshire bull (SK), judged by production of spermatozoa, was normal. The high *p*H of the semen of this bull may have been due to a reduction in the metabolism of the spermatozoa or to alteration in function of the accessory reproductive organs. In the Friesian bull the depression of spermatogenetic function can probably account, to some extent, for the high *p*H.

When two ejaculates are collected, one after the other, from fertile bulls the second ejaculate is more acid than the first and this change in reaction is in general associated with the better quality of the second ejaculate, in that there is a greater concentration of spermatozoa of higher motility (Anderson, 1941, 1942). Davis and Williams (1939) found that the mean *p*H of ejaculates collected successively, increased from the first to the third ejaculate, but also the concentration of spermatozoa decreased from the first to the third ejaculate, which is in agreement with the inverse relationship between *p*H and concentration of spermatozoa. In sterile bulls with either epididymitis or small testes the *p*H of successive ejaculates became increasingly alkaline. In epididymitis the function of the epididymis is diminished or stopped and in bulls with small testes which frequently have diminished sex desire, it is probable that the function of the epididymis is also depressed. Successive ejaculates from such bulls therefore probably contain a relatively and increasingly smaller epididymal fraction and for this reason are more alkaline. An increase in the *p*H of successive ejaculates has also been noted in some bulls which appear to have normal testes and epididymes. This change in the alkaline direction of successive ejaculates may prove of some diagnostic significance.

Summary

The *p*H of the semen of sterile bulls has been determined. An alkaline reaction was characteristic of the semen of typical cases of epididymitis, and of bulls with small testes. In clinically normal bulls, semen of poor quality was either about the neutral point or alkaline. The alkalinity of semen was associated with a decrease in the concentration or absence of spermatozoa. In sterile bulls the *p*H of successive ejaculates became increasingly alkaline.

References

Anderson, J. (1940.) *Vet. J.*, **96**, 18.
———. (1941.) *Vet. Rec.*, **53**, 197.
———. (1942.) In the Press.
Davis, H. P. (1938.) *Proc. Amer. Soc. An. Prod.*
Davis, H. P. and Williams, N. K. (1939.) *Proc. Amer. Soc. An. Prod.*
Edwards, J. and Walton, A. (1939.) *Proc. 7th Internat. Congr. Genet.*, Edinburgh.
Gunn, R. M. C. (1936.) Bull No. 94, Council Sci. & Ind. Res., Australia.
Hatziolos, B. (1937.) *Z. Zucht.*, B. **38**, 199.
McKenzie, F. F. and Berliner, V. (1937.) Res. Bull. 265, Agric. Exp. Sta., Univ. Missouri.
Milovanov, V. K. (1934.) Artificial Insemination of Livestock, Moscow.
———. (1936.) *Probl. Zivotn.*, No. 3, 100.
Schneerson, S. S. (1936). *Sborn. Trud. zooteh. Kaf. s. h. Skol. Kirov*, **1**, 142.
Sergin, N. P. (1935.) *Probl. Zivotn.*, No. 12, 100.
Webster, W. M. (1934-1935.) Dept. Agric. An. Rep., New Zealand, p. 26.
———. (1938). Personal Communication.

A Note on the Induction of Oestrus in the Cow With Oestradiol Benzoate

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During the last few years, experiments on the effect of sex hormones in anoestrous cows have been made at this station. These experiments are, as yet, incomplete, but since they support recent reports on this subject a brief statement of the results may be of some value at this moment.

Two preparations have so far been used: (1) an oestrogen-oestradiol benzoate (Dimenformon, Organon), and (2) an anterior pituitary-like preparation (Pregnyl, Organon). The latter preparation has proved effective in inducing both oestrus and ovulation in anoestrous cows, but with the smallest dose so far used, 2,500 units, this preparation is considerably more expensive than oestradiol benzoate.

Oestradiol benzoate has proved highly effective as a single intramuscular injection of 50,000 international units (5 mgm.), the dose recommended by Steinach, Staheli and Grüter (1934), who were the first workers to use synthetic oestrogen in the cow. They found that oestrus was produced in two to three days and that a single injection initiated the full sexual cycle and not merely an isolated oestrus. These results have been confirmed by Dr. Macbeth of Organon Laboratories (personal communication), by Folley and Malpress (1941) and by the writer. A synthetic oestrogenic preparation, stilboestrol dipropionate has proved equally effective (Montgomerie and Brownlee (1941).

Conception has been obtained at the first oestrus after injection of oestradiol benzoate in a number of cases, indicating that the indirect stimulation of the ovary has caused ovulation. Conception at the first oestrus has also been obtained by Montgomerie and Brownlee and by Folley and Malpress, apparently more frequently by the former workers than by the latter.

Folley and Malpress, supported by Montgomerie and Brownlee consider that the use of oestrogen is better than the removal of the corpus luteum by rectal manipulation, because of the difficulty and danger of this operation, a statement with which the writer on the basis of experience in removing the corpus luteum in a large number of cases, does not agree. It appears unnecessary to use a hormone preparation to induce oestrus, when this can be safely and efficiently accomplished by a simple manual manipulation, and this point is perhaps of greater importance at the present time when economy in the use of medicinal preparations is essential. The writer believes that oestrogen is not necessary except in the anoestrous condition, when no corpus luteum can be detected in the ovary, or when it is impossible to express the corpus luteum.

The author wishes to express his thanks to Dr. Macbeth, of Organon Laboratories, for the hormone preparations used in these experiments.

References

Folley, S. J. and Malpress, F. H. (1941.) *Vet. Rec.*, **53**, 551.
Montgomerie, R. F. and Brownlee, G. (1941.) *Ibid.*, **53**, 567.
Steinach, E., Stàheli, A. and Grüter, F. (1934.) *Wein. klin. Wschr.*

Weekly Wisdom

"*Not frequently nor without necessity to say to anyone, or to write in a letter, that I have no leisure; nor continually to excuse the neglect of duties required by our relation to those with whom we live, by alleging urgent occupation.*"—Marcus Aurelius.

Some Aspects of My Work with the U.S. Bureau of Animal Industry and the U.S. Army*

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I am very happy to attend this meeting. Little did I dream a few short months back that such an opportunity would ever be afforded me.

Shortly after my arrival in Ulster I made an unofficial call on Captain Munro, of your Ministry of Agriculture. At that time my duties were confined more or less to my particular organisation. Soon after, I was detailed to the higher headquarters to inaugurate veterinary inspection for our Army. From this time on my dealings with the Ministry of Agriculture became of an official nature. At this time I wish to take the opportunity on behalf of my Commanding General and myself to thank you, Captain Munro, your entire staff, and the civilian and municipal authorities for the splendid co-operation and assistance which they so willingly gave me. I am sure now since I have returned to my own organisation, and Major Arundel has taken over the work that I started, that he is enjoying the same cordial relations.

When I am attending a meeting and some speaker I do not know takes the floor the thought that immediately occupies my mind is, "who is this person, what has he done?" Since you may not be able to find answers for such questions, I will tell you something about myself. I am not one of our great veterinary surgeons—pathologist, bacteriologist, or practitioner. I am just one of the plain garden variety veterinarians of America. I am reminded of how one of our dental officers used to describe himself as a "Cross Roads" dentist. Yet "Cross Road Veterinarian" would hardly fit in my case as I have never given any time to the practice of veterinary medicine as such. Since my graduation from Kansas State College in 1935, I have devoted my entire time to regulatory work: the first three years in the field of bovine tuberculosis eradication, of which I will speak later; the next three years in meat inspection, and the balance has been with the Army. As you can see, each of these endeavours is in the scope of preventive medicine, which not only has a bearing on the health of our livestock but also among our human population.

I shall speak first of the Veterinary Service with the Army. Prior to the World War, Veterinary Service with our Army was on a contract basis. This system was more or less unsatisfactory even for an army in peacetime, and could not function efficiently with an expeditionary force. Thus, the Veterinary Corps was formed as a part of the Medical Department. That was in the day of horse-drawn artillery and cavalry. The Veterinary Officer was principally concerned with the health and treatment of horses, and the inspection of forage. Food inspection was secondary. To-day the situation is reversed. In most cases the Veterinary Officer is primarily a food inspector. (In my country the term "food" applies to human, while "feed" applies to animals.) Veterinary inspection of food applies to all foods and food products of animal origin; it begins at, and in some instances prior to, purchase, and ends with issue to troops. From issue to consumption the supervision is under the jurisdiction of the Medical Officer concerned. Our food inspection is divided into two general classifications which may be designated as Sanitary and Specification.

Inspections for specification are made prior to purchase, at purchase, at origin, and at destination. They deal with type, class and grade. No inspection is made which does not include a sanitary inspection.

Sanitary inspections include *ante-mortem*, *post-mortem*, and a general sanitary inspection of food products. They also include sanitary inspections of meat slaughtering, processing and packing establishments, poultry packing establishments, fish canneries, dairy farms, creameries, and milk and ice cream plants.

The Veterinary Service of the Army does not duplicate the work of our other Federal agencies. For instance, in the purchase of meat the inspection of the Bureau of Animal Industry for sanitary conditions of the establishment, *ante-mortem* and *post-mortem*, are accepted. The Army inspection would then begin with the inspection for compliance with specifications of the contract. This we feel is very important. Not only does it assure the ordinary soldier that the food which he eats is clean and wholesome, but also that for each dollar expended for food value is received. In times like these the lowering of the standards of grading a fraction of a point amounts to a colossal figure. So much for Army inspection.

The next subject is one that I enjoy discussing, and is one of which much can be said. It is Bovine Tuberculosis Eradication. As you know, the eradication of bovine tuberculosis was started in America some years ago. At that time a European government had abandoned the idea as not practical. For years the work went on progressing slowly. It was not until about 1928 that the effort was put on a wholesale basis. 1938 saw the whole of the United States as a modified tuberculosis-free area. Stanislaus County, California, was the last county to become modified. By "modified area" we mean that the incidence of reactors, on a complete test of a county, is less than one-half of 1 per cent.

This gigantic programme was financed by the States and Federal Governments. An indemnity was paid for each animal (except steers and grade bulls) reacting to the test. The years that I was working on this programme the maximum indemnity was $25 for a grade and $50 for a registered pure-bred animal.

Following are a few details of the test: The intradermal test was used, and was applied to the caudal fold and the vulva. In most instances the caudal fold was used. The work was carried on by accredited veterinarians, employed for the most part by the Bureau of Animal Industry. Some were employed by the separate States. These veterinarians worked in crews which consisted of a supervisor and all the way from one or two to twenty-odd veterinarians. A supervisor would be assigned a county, and he would map the work out, giving each veterinarian a certain area to test. This area we called a territory. In States where the roads were built on section lines, the territory usually consisted of a geographical township. A geographical township is an area of 36 square miles—6 miles by 6 miles—36 sections. In most states the veterinarian worked with a lay helper. Work was arranged so that Monday, Tuesday and Wednesday were devoted to applying the test, while Thursday, Friday and Saturday were days for reading the test. The number of animals tested each week varied greatly with conditions. In an average week one would test 300 head. Some weeks many more were tested.

Many systems were used to identify animals to which the test was applied, but only one system was used to identify reactors. A reactor tag was placed in the left ear, and the letter "T" was branded on the left jaw. All reactors were slaughtered at establishments maintaining Federal or State meat inspection, and the results of the *post-mortem* examination were made a matter of record.

The greatest drawback to the whole programme was the lack of education preceding it, and this was only in certain sections. In some instances opposition reached an organised basis, and it was necessary to force the work by use of local law enforcement agencies. In at least one instance martial law was declared and the National Guard called in order to proceed with the programme. Had the proper education preceded the programme this would not have been necessary.

Why should tuberculosis be eradicated from the bovine population? As far as I am concerned there are two vital reasons. First, from a public health standpoint. The incidence of bone and glandular tuberculosis among the human population decreased remarkably with the eradication of tuberculosis in the bovine. For this reason alone the programme was worth many times its cost. Second, a tuberculous herd is unprofitable to the owner in comparison with a tuberculosis-free herd.

Can bovine tuberculosis be eradicated from the North of Ireland? The answer is emphatically "yes." But such a thing will never come to pass without the wholehearted support of every veterinarian in this province. The education that must precede such a programme can only be given by the veterinary profession. To me it is the ethical duty of every veterinarian to foster such a programme. I cannot help but point with pride to the magnificent work done by the United States Department of Agriculture Bureau of Animal Industry in the eradication of bovine tuberculosis.

*Address to the members of the North of Ireland Division, N.V.M.A., on the occasion of the annual general meeting of the Association at Belfast, July 2nd, 1942.

WORLD RECORD YEAR MILK YIELD

A new year record yield of milk has been set up in the U.S.A. by the Holstein-Friesian cow Carnation Ormsby Madcap Fayne. With a yield of 41,943 lb. of milk in 365 days she beats the record of the Wiltshire non-pedigree Shorthorn cow, Cherry, which gave 4,164 gallons in 365 days from calving.

Unlke Cherry, who was kept from the bull for a year, the new champion was forward in-calf when she finished her year's work. She started her year with a production of 102 lb. on the first day and closed with 96 lb. on the final day. Her best day's yield was 146 lb., and for the whole year she averaged 115 lb. Carnation Ormsby Madcap Fayne was, like Cherry, milked four times daily throughout the year.—*Farmers' Weekly.*

CLINICAL COMMUNICATION

Keratitis and Blepharitis Successfully Treated

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WALSALL

Subject.—Liver-and-White 7-year-old springer spaniel dog.

History.—For about a month there had been a discharge from the eyes.

Symptoms.—I was called in to examine the above dog's eyes, which were found to be covered with a thick corneal opacity, and the eyelids were surrounded with extensive orbital eczema. He was afraid to face the light and the painful condition of the eyes caused him to keep them closed all the time. When walking about he opened his eyes, but bumped into objects, being quite blind. The lower eyelids were dependant, but as the upper lids were inclined to be inverted, an entropion operation on both upper lids was advised.

Treatment.—The dog was brought into the kennels for treatment. The entropion operations, together with 5 per cent. neoprotosil eyedrops, did not improve the condition at all.

I then decided to try sulphanilamide in cod-liver oil. The sulphanilamide was used in the strength of approximately 1 in 8 of cod-liver oil. A few drops of this dressing were instilled into each eye, and on the orbital eczema three times daily regularly.

After the first day's treatment there was marked improvement, as the dog kept his eyes open all the time. Gradually the opacity began to clear and the purulent discharge diminished. After a week he could see as well as ever, the eczema had cleared up and there was scarcely any corneal opacity.

I report this as the condition was so chronic and did not improve with any of the usual treatments. Now I am doubtful as to whether cod-liver oil alone would have cleared up the trouble, or whether the oil together with sulphanilamide produced the desired results.

ABSTRACTS

I.—THE ACTION OF TWO AROMATIC DIAMIDINES ON *TRYPANOSOMA CONGOLENSE* INFECTIONS IN CATTLE, WITH A NOTE ON DELAYED POISONING BY 4:4′-DIAMIDINO DIPHENOXY PENTANE. DAUBNEY, R., and HUDSON, J. R. (1941.) *Ann. trop. Med. Parasit.* **35.** 175-186;
II.—A NOTE ON THE CHEMOTHERAPEUTIC ACTION OF 4:4′-DIAMIDINO STILBENE IN BABESIA INFECTIONS OF DOMESTIC ANIMALS. DAUBNEY, R., and HUDSON, J. R. (1941.) *Ann. trop. Med. Parasit.* **35.** 187-190;
III.—TREATMENT OF CANINE BABESIASIS BY 4:4′-DIAMIDINO DIPHENOXY PENTANE. CARMICHAEL, J., and FIENNES, R. N. T.-W.- (1941.) *Ann. trop. Med. Parasit.* **35.** 191-193.]

These three papers record the results of experiments with two aromatic diamidines which Lourie and Warrington Yorke have found to be trypanocidal to *Trypanosoma congolense* and *T. rhodesiense in vitro* and also *in vivo* in mice and rabbits, namely 4:4′-diamidino stilbene and 4:4′-diamidino diphenoxy pentane. Daubney and Hudson used cattle inoculated with a highly virulent strain of *T. congolense* maintained by them in rabbits. Single large doses of 10 to 20 mgm. per kilo. of body weight given intravenously and repeated smaller doses of 2·5 and 5 mgm. (and in one case 10 mgm.) were tried, but neither of the compounds completely cured the infections. The trypanosomes were not found in smears of the peripheral blood for periods of two to four weeks after treatment, but they usually reappeared, although often in reduced numbers and some animals seemed to have been premunized. The red cell count fluctuated during treatment, often falling to 2·5 millions. The larger doses (10 mgm. per kilo. and upwards) of 4:4′-diamidino diphenoxy pentane caused immediate poisoning; delayed poisoning occurred both with single doses of 5 to 15 mgm. per kilo. and with repeated doses of 5 mgm. per kilo. and upwards. Doses as large as 20 mgm. per kilo. of 4:4′-diamidino stilbene were not poisonous to cattle. Larger doses are hardly practicable, because the solubility of the drug is only 1·5 per cent. in the cold.

Either compound will premunise cattle, although the dose of 2·5 mgm. per kilo. of 4:4′-diamidino diphenoxy pentane does not leave a wide margin of safety and this dose causes liver injury (swelling, putty-coloured spots, extremely advanced fatty degeneration); on the other hand, this compound is probably more active in cattle than 4:4′-diamidino stilbene, which is outstandingly efficacious against *T. congolense* in mice and rabbits.

In trypanosome infections the premunised state is not so stable as in piroplasm infections and a number of compounds are known which have "sufficiently curative action to bring animals into a state of premunition."

The delayed toxic effect of 4:4′-diamidino diphenoxy pentane has not been described by other authors; the liver injury due to it appeared to occur simultaneously with the onset of blood-sugar changes and the authors refer to the work of Devine, who related the blood-sugar changes observed by him in rabbits given intravenously large doses of undecane diamidine and 4:4′-diamidino stilbene to hepatic injury and reduced ability of the liver to deaminise amino-acids. They also refer to Broom's view that the diamidines only affect the blood-sugar level when they are given in lethal doses large enough to cause extensive renal and hepatic damage. Little renal damage was observed by Daubney and Hudson in cases of delayed poisoning with 4:4′-diamidino diphenoxy pentane.

II.—Daubney and Hudson also report on the treatment of 16 dogs infected with *Babesia canis* and of two horses infected with *Babesia caballi*.

A foal with acute biliary fever was given 8 c.c. of a 1 per cent. solution of 4:4′-diamidino stilbene, a dosage of 1·5 mgm. per kilo of estimated body weight. Hyperaesthesia and swelling of the muzzle and tongue followed, but these passed off in a few hours; the fever disappeared and did not recur. A thoroughbred, also suffering from acute biliary fever due to *B. caballi*, was given the same dose-rate of the same drug. It was greatly distressed for 48 hours, but rapidly recovered from the biliary fever. A normal thoroughbred was then given 1·5 mgm. per kilo. and in ten minutes was excited, restless, neighing and sweating profusely with an accelerated pulse and indications of abdominal pain. After five hours it was normal again and there were no after effects. The authors conclude that, in spite of the rapid recovery from biliary fever, the drug is not suitable for horses.

For dogs it is, however, useful, 13 out of 15 dogs treated making rapid clinical recoveries after "the full standard dose of 1·5 mgm. per kilo. of body weight," a dose much less, and therefore safer than the 2·5 mgm. per kilo. needed to produce a *sterilans magna* in Lourie and Yorke's cases. No relapses occurred. After 48 hours the blood was free from parasites and it remained so. Two dogs died, both being advanced cases. The 16th dog was given 0·9 mgm. per kilo. There were no parasites in the blood after 48 hours, but after four days they reappeared. Acaprin was then given, because Lourie and Yorke found that repeated dosage with 4:4′-diamidino stilbene induces drug-resistance; no further relapse occurred. Most of the animals showed, within a few minutes of treatment, hyperaesthesia, and restlessness; more than half showed transient swellings of the face and a desire to scratch; but after an hour or two these symptoms disappeared.

III.—Carmichael and Fiennes treated 116 dogs infected with *B. canis* with 4:4′-diamidino diphenoxy propane, giving either a single dose of 5 mgm. per kilo. or two doses on successive days of 2·5 mgm. per kilo. The subcutaneous, intravenous and intramuscular routes were equally effective, but the authors prefer the intramuscular route, because oedematous swelling lasting four to six weeks resulted from subcutaneous injection. There were no cases of toxicity due to the drug; 3·4 per cent. died. Relapses occurred in 8·6 per cent. and all these responded to second treatment. The remainder were apparently cured. The authors consider the drug to be the most valuable available for this disease and that it will supersede acaprin and trypan blue. If, however, more than one relapse occurs, they recommend the use of pirevan or acaprin, because of the drug-resistance developed by the parasite to 4:4′-diamidino diphenoxy propane. Acaprin has, they find, a very small margin of safety and trypan blue, although it is effective in a high proportion of cases, may cause sterile abscesses with extensive sloughing and occasional collapse after 14 days or so, due to its action on the heart.

G. L.

A mare which cost £17 in 1924 was sold at Perth for £39—a striking indication of the present demand for work horses. Besides giving 18 years' faithful service on the farm, she has appreciated in value by nearly 130 per cent. How would the accountants treat a case like this for income tax purposes? Who ever heard of a tractor appreciating to that extent in 18 years! And anyway the tractor comes under the Order controlling the price of second-hand implements; the horse does not.—*Scottish Farmer.*

REVIEW

[SPONTANEOUS AND EXPERIMENTAL LEUKAEMIA IN ANIMALS. J. Engelbreth-Holm, M.D. (1942.) Pp. xxiii + 245. Oliver & Boyd: London. 15s. net.]

Although the diseases of the blood-forming organs have had a particular fascination for the experimentalist, the nature of spontaneous leukaemia is still the subject of much speculation. The literature contains on the one hand numerous valuable but scattered observations on naturally occurring leukaemia, and on the other hand a mass of evidence regarding the experimentally induced disease. It is difficult for the student of this subject to obtain a concise picture of what has been achieved in the past, of the nature of present-day investigations and of the probable trend of future researches.

Dr. Engelbreth-Holm, who has written his book on behalf of the Scientific Advisory Committee of the Lady Tata Memorial Trust, has performed a valuable service in collecting into one small volume many of the important facts which are known about this baffling problem. The treatise presents a balanced and critical analysis of the relationship of the different types of animal leukaemia with particular reference to their significance for human medicine. It is divided into five parts with the following headings: (1) Spontaneous leukaemia in animals. (2) Transmission experiments. (3) The rôle of heredity in animal leukaemia. (4) Attempts to produce leukaemia experimentally. (5) Relationship between human and animal leukaemias.

It is perhaps inevitable that the major part deals with diseases of the blood-forming organs induced experimentally in the fowl and the mouse since these are the species which have proved of greatest value to the laboratory worker. The author rightly draws attention to a difference, which seems to be fundamental, that the leukaemias of the fowl and the mouse are frequently transmissible by the inoculation of cell suspensions or cell-free filtrates, whereas in general the aetiology of mammalian leukaemia is as yet unknown.

Possibly one of the most valuable sections is that which deals with classification and nomenclature. The author suggests the terms stem-cell leukaemia, erythro-leukaemia (especially in birds), myelogenous - leukaemia, lymphogenous - leukaemia, monocytic - leukaemia and plasma cell-leukaemia, so far observed in human beings only. The cases are leukaemic or sub-leukaemic according as to whether there is or is not an increase in the blood of the kind of cells concerned. Of particular interest to the veterinarian are lymphosarcomata in cattle, the tumours corresponding to myelogenous leukaemia occurring in pigs, lymphogenous leukaemia and venereal sarcoma in the dog and erythro-leukaemia in fowls, in which may be included fowl paralysis although the exact connection of the latter to the frank leukaemias is as yet much disputed. It is curious that there is practically no reference to Hodgkin's disease.

Although the book is mainly intended for the specialist in this subject, who will find it invaluable for reference purposes, it can be read with profit by those who wish to obtain a comprehensive picture of leukaemia. The illustrations are well chosen and extremely clear.

The Toilet M. E. H.

IN PARLIAMENT

The Nation's Food

The House of Commons gave a favourable reception on Tuesday of last week to the review of the agricultural situation given by Mr. R. S. Hudson, Minister of Agriculture, with particular reference to the measures announced to further the effective application of science to agriculture.

The Minister assured the House that everything possible was being done to ensure that the third war-time harvest was as great as possible and that next year the tillage area would be substantially increased. He was pressing for an increase in the production of milk: dairy farmers had responded well and the results so far were encouraging. In the first six months of this year, in spite of a very unfavourable spring, we actually produced 10,000,000 gallons more milk than in the best pre-war year, and 13,000,000 gallons more than last year.

The success of the whole policy depended on the extent to which the individual farmer could adapt his practice to the new requirements. Last year he (Mr. Hudson) set up the Agricultural Improvement Council to see if they could get the results of research utilised more quickly in ordinary current practice. They had hit upon a piece of machinery which was going to produce results of great value. The Agricultural Council came to the conclusion that they must try to decentralise the task of applying the results of research to agriculture. That was being made the basis of the organisation. The Council decided that in addition to tests for new methods of agricultural technique, there was a need to expand the advisory work in the different counties and to arrange practical demonstrations. Their aim was, without any unnecessary frills or complications, to get into the farmer's mind the necessity for sound farming practice coupled with modern knowledge. The activities of the Council included the setting up of an Agricultural Machinery Board and the removal of the Agricultural Engineering Institute from Oxford to Askham Bryan, Yorkshire. Some members of the Board had formed a committee, irreverently known as the Heath Robinson Committee—(laughter)—which was working out practical ideas for labour-saving devices which the farmer could make for himself with the aid of the blacksmith or carpenter. A committee had been studying the problems of ley farming, alternate husbandry, and seed supplies. The question of seed supplies had now been put on a sound basis. Another committee, under the chairmanship of Lord De La Warr, had been investigating the difficulties of upland and hill sheep farming, and the problem of derelict land was under investigation. The question of feeding of livestock was also under active consideration by various research institutes.

Diseases affecting dairy cows were, of course, of particular importance in war-time. They were now reaping the fruits of several years' research in dairying, and, in conjunction with the National Farmers' Union and the National Veterinary Medical Association, had been able to launch a scheme for the control of bovine abortion, sterility and mastitis. In this they had been very materially helped by some researches that were made in the United States and some virus which they had sent over.

Speaking in reference to the respective functions of the Agricultural Research Council and the recently instituted Agricultural Improvement Council, the Minister said: "The Committee [the House was in Committee of Supply] will, no doubt, remember that I said last year that I had set up a new body, called the Agricultural Improvement Council, to see whether we could not get the results of research adopted and utilised more quickly in ordinary farming practice. At the same time, we made some alterations in the constitution and duties of the Agricultural Research Council. One should not, of course, count one's chickens before they are hatched, but I think we happen to have hit on a piece of machinery which will produce results of great value to agriculture and to the country. Perhaps the Committee would be interested if I told them briefly of what we are doing. The work of the Agricultural Research Council and that of the Agricultural Improvement Council are, of course, complementary one to the other. The Agricultural Research Council must ask itself every day, "Are we doing everything in our power to see that the research organisation is properly staffed and equipped to obtain the maximum possible knowledge and relate it to the needs of agriculture?" The Agricultural Improvement Council should be asking itself every day, 'Are we doing everything in our power to see that the results achieved by the Agricultural Research Council are either applied to agriculture or else given the necessary opportunity of showing whether their application would be of advantage to agriculture?' By the very nature of things, as the Committee will see, these two bodies are bound to some extent to overlap and we have tried to avoid the evils of such overlapping by appointing a certain number of members of each body to be members of the other. In addition there are frequent meetings of the two secretariats."

In further reference to the progress of the home food production campaign, Mr. Hudson announced (in reply to a question) that we were now producing two-thirds of the food we consumed.

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Scientists and the War Effort

In the House of Lords on Wednesday of last week, Lord Strabolgi asked the Government what further measures had been taken, or were proposed, to make the most effective use of the scientific and inventive talent of the nation for war purposes. The noble lord, who also moved for papers, said that his own impression was that, while there were eminent scientists attached to the various Ministries, their work was departmentalised. His suggestion was that there should be a scientific general staff, consisting of a team of the best brains available, to work whole time, and with prestige and influence equal to that of the Chiefs of Staff Committee. The chairman should sit on the Defence Committee, and should attend the War Cabinet in an advisory capacity when necessary—and that should be nearly always.

The next development in war would be the carriage of whole armies, with their artillery, stores, equipment and transport, by air. He felt uneasy whether the people who had to make such decisions as these were yet seized with these immense developments; he felt they were still thinking in terms of 1914.

Viscount Samuel said that British science had achieved very great things, and in some directions had given a lead to the world, but of late there had been serious complaints and it was impossible to doubt that there was in general substance in them. The Parliamentary and Scientific Committee, after hearing a number of these complaints, sought an interview with the chairman of the Scientific Advisory Committee of the Cabinet, Mr. Butler. A remarkable series of spokesmen expressed in that deputation the sense of frustration. The spirit of departmentalism was unquestionably a barrier to the adoption of various proposals with sufficient speed. We were not waging the war "in the long run," and it was of vital importance that there should be everywhere the sense of urgency, and that matters should be dealt with hour by hour and not handed from one committee to another for leisurely consideration. Those who were intimately acquainted with the subject considered that the American organisation was superior to our own. Whatever body was set up should have a chairman of sufficient status and authority to give it prestige and influence; if he could be a member of the War Cabinet so much the better; and he must be someone with a knowledge of science in relation to industry. The membership of such a body should be small, but they should give their whole time to the work, and the organisation should have power to develop as the results of experience and the requirements of the situation demanded.

Lord Hankey said that he had great sympathy with the movement for bringing science more prominently into government. The Government should make as much use of scientists as they possibly could, not only in the Supply Departments, but extend it even further than they had to operations and, he would dare to say, to planning; scientists could make a contribution to planning. The scientists should not open their mouths too wide, nor expect everything they were asking for. When they got inside they might find that the way to do things was not as they had thought. There might be more haste and less speed of there was too elaborate an organisation. Once the scientists had established a right by contact, their sheer ability, used with tact and energy, would do the rest.

Viscount Bledisloe said there was a sense of frustration abroad in the country regarding the harnessing of science to the war effort. It was disturbing to see a man of the eminence of Sir Henry Tizard, who was directing the scientific side of aircraft production, being transferred to the headship of an Oxford college. The Government departments were not scientifically minded. There was a greater gap between scientific research and the application of its more useful results in this country than in any other. There should be a central organisation, not advisory only, but in a position to carry things out in practice at the behest of the Government, to bring scientific opinion to bear upon our war effort.

Lord Snell, replying to the debate, said he did not agree with the suggestion that we were slower in the scientific uptake than other nations. The real point was that at all times under our system of democratic government, and in all circumstances, under any government, the Minister must in the end be personally responsible to Parliament. No set of men, however eminent, could be allowed to put their judgment before that of the Minister unless serious inroads were to be made into the doctrine of Ministerial responsibility. The right place for scientists was in co-operation with the Minister who had to bear the responsibility. The idea appeared to be that the proposed scientific general staff should have direct access to the War Cabinet and the Defence Committee and should have authority over the departmental organisations, or that its advice should be taken in preference to the advice of those organisations. He asked the supporters of that idea to consider how that could be reconciled with our system of government, and in particular with the individual responsibility of Ministers. It was clear that it could not be so reconciled. Decisions must be taken by Ministers who were responsible for the consequences of those decisions, and it was to the responsible Ministers that the War Cabinet in the first place must look for advice. Nor could the executive heads of the organisations for scientific research in the great Government Departments be expected to continue to exercise their great responsibilities with enthusiasm and courage if their decisions were at any moment liable to be overridden by some central body of scientists.

He did not wish to give the impression that the present organisation was regarded by the Government as necessarily perfect. That organisation was not static, and the Government were continually considering methods by which it might be supplemented or improved. It might be that something further might still be done to that end, and full consideration would be given to all that had been said in the debate. It was impossible to believe that the Government had ignored, belittled, or hindered the application of science or scientific progress to our national needs when so much was at stake.

In regard to an airborne army, the Government were certainly looking ahead, but not even through a telescope could they see one point only magnified out of all proportion to the rest of the vast arena. The resources required for the immense amount of equipment essential to a large-scale airborne operation must be kept in balance with other requirements over the whole field. It would be fatal, in the opinion of the Government, to detract too much from other air efforts and thus jeopardise the command of the air which was an essential preliminary to airborne operations. Sir Henry Tizard was not directing scientific matters in the M.A.P. He gave that up and became scientific adviser. The Government had no knowledge of his intention of giving this up because of his acceptance of the appointment at Magdalen. It was by no means certain that he would give up that appointment. Far more scientific research was going on than was generally realised. While the Government could not be satisfied with anything less than the proved best, they felt that there had been good progress and that many most valuable contributions had been made by scientific workers and that more was yet to come. The Government appreciated most sincerely all that scientists had done and they wished to encourage them in their work. But that work must be in co-operation with the Minister. Nevertheless, there might be ways of improving present relationships and more accommodation might be possible to remove from the minds of scientists—if they felt it—a sense of frustration, and these would receive the full consideration of the Lord President of the Council.

The motion was, by leave, withdrawn.

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QUESTIONS

Tuberculin-Tested Cows (Marketing)

Mr. David Adams asked the Minister of Agriculture whether he is aware that it is common for cows which react to tests for tuberculosis to be sent to market and sold as healthy cows, thereby spreading the disease; and whether prompt steps will be taken to prevent this practice?

Mr. Hudson: The sale of cows reacting to the tuberculin test is not, on that account, restricted. In view of the very much larger number of untested cattle which, if tested, would react, no such restriction would serve any useful purpose.

Mr. Adams: Is the Minister aware that many cows seriously affected with tuberculosis are permitted to be put on the market and disposed of as healthy cows? Is that satisfactory?

Mr. Hudson: That is merely repeating the Question on the Paper, which I have answered.

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Milk Pasteurisation

Mr. Leach asked the Minister of Health whether he has any evidence to prove that cases of tuberculosis notified in recent years were exclusively persons reared on unpasteurised milk; and whether any inquiry on this point is made when tuberculosis is notified?

Mr. E. Brown: In reply to the first part of the Question, no evidence is available. In regard to the second part, I am advised that it would be unusual in medical practice not to make such inquiries in cases of tuberculosis among young children, but that the point becomes less relevant after childhood.

Mr. Leach: How does the right hon. Gentleman know there is so much tuberculosis as that if he has no evidence?

Mr. Leach asked the Minister of Health whether he is aware that the infant mortality from certain forms of tuberculosis is higher in Greater London and the county boroughs, where a great

part of the milk consumed is pasteurised, than in rural districts where most of the milk consumed is unpasteurised; and is he satisfied that pasteurisation is doing the work claimed for it in the circulars issued by his Department?

Mr. Brown: If as I assume from my hon. Friend's reference to pasteurisation the first part of the Question relates to non-pulmonary tuberculosis, the answer is, "No, Sir"; the increase in child mortality from non-pulmonary tuberculosis appears to be greater in country than in town. The information available therefore casts no doubt on the efficacy of pasteurisation.

Mr. Leach: How does the right hon. Gentleman like this cooked stuff?

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Slaughterhouses (Inspection)

Mr. David Adams asked the Minister of Health whether he is aware that the efficient inspection of meat in public and other abattoirs results in the elimination of carcases or parts of the same liable to convey to consumers various diseases; and, as such inspection is not possible in areas where abattoirs do not exist, resulting in the marketing of diseased food, what steps are being taken to meet this situation?

Mr. E. Brown: I am not aware of the precise circumstances to which my hon. Friend refers. I would point out, however, that notice of intention to slaughter an animal for sale for human consumption is required by the Public Health (Meat) Regulations to be given to the local authority and that under an Order made by my right hon. and Noble Friend the Minister of Food no person may slaughter for human consumption any livestock except in accordance with a licence granted by his Department.

Mr. Adams: Is the Minister aware that owing to the lack of the necessary supervision of slaughterhouses diseased meat is unquestionably being placed on the market? Should it not be the policy of the Ministry to provide at the earliest moment public abattoirs?

Mr. Brown: My understanding of the meat and livestock scheme gives the impression that there are opportunities for the inspection of slaughterhouses. I have inquired from my Noble Friend the Minister of Food, who states that in the opinion of his Ministry's area technical advisers meat inspection, generally speaking, is carried out to a greater extent than in peace-time.

Mr. Adams: But is the Minister aware that there are scattered slaughterhouses in all great centres of population? Where public abattoirs do not exist, supervision is very superficial.

Mr. Brown: That is a general statement, but if the hon. Gentleman has any particular evidence with which to back it up, I would like to consider it, as, I am sure, would my Noble Friend the Minister of Food.

SCIENCE CANNOT BE NATIONALISED

. . . Although wars and economic rivalries may for longer or shorter periods isolate nations and split them into separate units, the process is never complete because the intellectual life of the world, as far as science and learning are concerned, is definitely internationalised, and whether we wish it or not an indelible pattern of unity has been woven into the society of mankind.

There is not an area of activity in which this cannot be be illustrated. An American soldier wounded on a battlefield in the Far East owes his life to the Japanese scientist, Kitasato, who isolated the bacillus of tetanus. A Russian soldier saved by a blood transfusion is indebted to Landsteiner, an Austrian. A German soldier is shielded from typhoid fever with the help of a Russian, Metchnikoff. A Dutch marine in the East Indies is protected from malaria because of the experiments of an Italian, Grassi; while a British aviator in North Africa escapes death from surgical infection because a Frenchman, Pasteur, and a German, Koch, elaborated a new technique.

In peace as in war we are all of us the beneficiaries of contributions to knowledge made by every nation in the world. Our children are guarded from diphtheria by what a Japanese and a German did; they are protected from smallpox by an Englishman's work; they are saved from rabies because of a Frenchman; they are cured of pellagra through the researches of an Austrian.—*Raymond B. Fosdick, President, in "The Rockefeller Foundation—A Review for* 1941," quoted in *The North American Veterinarian*, July, 1942.

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Outbreaks of foot-and-mouth disease have been confirmed among cattle at Longborough, Gloucestershire, Martin, Lincolnshire, and Thameshaven, Essex. Outbreaks have also been confirmed in Fifeshire, near Dunfermline.

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Milk recording of itself does not produce a gallon of milk. But it does make sound feeding possible, and is the only possible basis for breeding.—*Farmers' Weekly.*

NOTES AND NEWS

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Sept. 20th.—Entries for Miss Aleen Cust Veterinary Research Scholarship (R.C.V.S.).

Oct. 13th.—R.C.V.S. Council and Committee Meetings, Royal Station Hotel, York.

Oct. 14th.—R.C.V.S. Council and Committee Meetings, Royal Station Hotel, York.

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SCHEME FOR THE CONTROL OF DISEASES OF DAIRY CATTLE

Statement showing the number of Undertakings notified to the Ministry of Agriculture during the week ended August 1st

County	Undertakings Notified		Total Undertakings		
	During Week	Previously	No.	No. of Cattle	
				Cows	Heifers
England					
Bedford	2	12	14	411	235
Berks	2	21	22	764	512
Bucks	1	17	18	501	404
Cambridge	—	4	4	139	56
Chester	5	119	124	3,869	1,448
Cornwall	—	—	—	—	—
Cumberland ..	1	12	13	451	380
Derby	8	26	34	1,342	600
Devon	9	39	48	814	548
Dorset	1	6	7	220	104
Durham	11	81	92	2,027	567
Essex	9	62	71	3,124	1,935
Gloucester	3	23	26	664	500
Hampshire	10	83	93	3,281	2,091
Hereford	—	9	9	205	76
Hertford	2	27	29	939	626
Hunts	—	1	1	13	8
Isle of Ely	—	—	—	—	—
Isle of Wight ..	1	2	3	45	11
Kent	2	33	35	809	465
Lancs	4	56	60	1,736	648
Leics	2	15	17	477	350
Lincs (Holland) ..	—	2	2	26	—
„ (Kesteven) ..	—	4	4	16	13
„ (Lindsey) ..	1	4	5	124	30
Middlesex	—	1	1	30	—
Norfolk	4	59	63	2,125	1,388
Northants	2	19	21	605	508
Northumberland ..	3	18	21	654	245
Notts	3	14	17	488	179
Oxford	1	12	13	351	424
Rutland	—	6	6	110	68
Salop	24	58	82	2,794	1,470
Soke of Peterborough	—	—	—	—	—
Somerset	1	35	34	981	391
Staffs	17	41	58	1,810	795
Suffolk, E. ..	1	15	16	314	170
„ W. ..	1	11	12	184	111
Surrey	5	35	40	1,209	462
Sussex, E.	3	54	57	1,418	702
„ W.	3	36	39	1,105	815
Warwick	6	30	36	924	635
Westmorland ..	1	2	3	61	113
Wilts	12	18	30	1,344	584
Worcester	6	57	63	1,355	710
Yorkshire, E.R. ..	1	5	6	121	87
„ N.R. ..	5	27	32	632	401
„ W.R. ..	7	52	59	1,765	558
Wales					
Anglesey	—	6	6	131	37
Brecon	—	2	2	25	9
Caernarvon ..	1	42	43	890	480
Cardigan	1	10	11	166	117
Carmarthen ..	—	99	99	1,724	968
Denbigh	1	22	23	568	250
Flint	5	34	39	878	459
Glamorgan	5	25	30	449	196
Merioneth	—	2	2	23	23
Monmouth	—	13	13	379	208
Montgomery ..	—	1	1	83	82
Pembroke	2	27	29	630	442
Radnor	—	—	—	—	—
Totals ..	194	1,544	1,738	48,273	25,694

Note.—Of the total of 1,738 undertakings notified to date 523 are for 1 year, 97 are for 2 years, and 1,118 are for 3 years.

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PERSONAL

Births.—Brooksby.—On July 24th, 1942, at Mount Alvernia, Guildford, to Muriel [Weir, M.R.C.V.S.], wife of John Burns Brooksby, B.Sc., M.R.C.V.S., Pirbright, Surrey, a daughter.

McCann.—On July 24th, 1942, to Ida, wife of P. J. McCann, M.R.C.V.S., of Preston, a son.

Marriage.—Westcott—Howson.—On July 25th, at St. Mary's Church, Putney, by the Rev. A. S. Hopkinson, E. J. Westcott, B.Sc., A.R.C.S., to Gillian Howson, M.R.C.V.S. Mr. W. A. Gibbs, M.R.C.V.S., was best man.

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R.C.V.S. OBITUARY

Kauntze, Henry Booth, Redlands, Totnes, South Devon. Graduated N. Edinburgh, May 22nd, 1901. Died July 28th, 1942; aged 64 years.

Tillyard, G. E., Lt.-Col., R.A.V.C. (retd.). Graduated London, December 20th, 1907. Died May 8th, 1942.

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ANIMAL DISEASES RESEARCH ASSOCIATION

Director's Review of Work at Moredun

In the course of his report to the Annual General Meeting of the Animal Diseases Research Association, held at Moredun Institute on July 14th, the Director, Dr. J. Russell Greig, records "with regret—not, however, unmingled with pride—that we are about to lose the services of Dr. W. S. Gordon, who has been appointed to the Directorship of the Agricultural Research Council's Institute at Compton in Berkshire. The good wishes of us all go with him."

The review proceeds: As previously reported, much attention is being given to means whereby the protective value of louping-ill vaccine prepared from chick embryo can be improved. It will be recalled that the vaccine which for many years has been used for general issue is prepared from certain tissues of artificially infected sheep whereas the "new type vaccine" is prepared by cultivating the virus in chick embryo. The chick embryo method possesses many advantages, but the keeping qualities of vaccines prepared in this way are not entirely satisfactorily and efforts are being made to render the new type vaccine reliable in all respects. Since in tick-infested districts the lamb is exposed to tick infestation and consequently to the risk of louping-ill infection at a very early period of its life, it has long been recognised that the protection of the young lamb against the disease is a matter of great importance. Many flock-masters inoculate the lamb at birth with louping-ill vaccine in reduced doses—2 c.c. to 2½ c.c.—but, although largely practised, the method is not without some risk. Last year a large-scale field experiment, involving many thousand lambs, was carried out for the purpose of testing the value of an immune serum injected on the day of birth as a protective measure. While in some cases the serum appeared to afford a high degree of protection, when one considered the results as a whole the protective value of the serum did not seem to be high enough to justify its adoption in practice.

Another possible method for the protection of the lamb consists in actively immunising the pregnant ewe. In investigating this possibility encouraging results have been obtained and these have been put to test in the field in a controlled experiment involving approximately 43,000 lambs. The results should shortly be available.

During the year 152,700 doses of louping-ill vaccine were issued.

Braxy vaccine continues to prove a highly effective means of controlling the disease. This year about 89,820 doses of braxy vaccine were issued.

Approximately 86,120 doses of lamb dysentery serum were issued this spring.

These products again appear to have proved highly satisfactory and have effected a very considerable saving to agriculture.

White scour and the allied diseases of calves are known to be associated with a specific group of microbes and it is also known that calves born from cows whose colostrum is deficient in vitamin A are predisposed to white scour, whereas calves receiving colostrum rich in vitamin A are relatively insusceptible to the disease. All our attempts to increase the vitamin A content of the colostrum of stall-fed cows by the administration during pregnancy of vitamin A and its precursor carotene have consistently failed, and large-scale field experiments to determine the preventive effect of administering the vitamin to calves at birth are proceeding. This year these experiments have been considerably impaired by the fact that the incidence of white scour has markedly declined in dairying districts where recently it was very prevalent.

Importance of Tick Eradication

The disease of young lambs known as cripples has long been prevalent in tick-infested districts. It is caused by a specific micro-organism and is manifested by the formation of abscesses in various parts of the body, including the joints of the limbs. Infection in the majority of cases probably results from tick-bite. A systematic study of the subject in its several aspects has been carried out with the ultimate object of obtaining a specific means of prevention. Considerable progress has been made.

The problem of tick infestation is one of primary importance in Scottish sheep husbandry. If it were possible to eradicate the tick then at least two and probably three major diseases of the sheep would disappear. Much more information is required in respect of the ecology of the tick—that is, its mode of life in relation to its environment. Dipping—valuable as it is as a palliative—can be no more than a palliative and cannot in itself exterminate the tick. To do this we must be able, by altering environmental conditions, to render the parasite incapable of multiplication. This implies long-term research of a fundamental character. The Department of Agricultural Zoology, Edinburgh University, and the Animal Diseases Research Association, were closely associated in this aspect of tick investigation which was proceeding actively until the outbreak of war, when research policy generally became concerned mainly with short-term work likely to yield quick results of practical application. The economic importance of the sheep tick and the sheep blow-fly is, I am persuaded, fully realised by the Agricultural Research Council, who are considering the resumption of ecological work in Scotland.

At the instance of the Ministry of Agriculture and Fisheries, this Institute, in conjunction with those at Cambridge and Weybridge, has carried out a systematic bacteriological and pathological examination of the tissues of certain bovine animals which in the field have given indeterminate reactions to the new (Weybridge) tuberculin or which have given positive reactions under conditions in which such reactions were unexpected. The object of such examination is to determine whether the animal was in fact suffering from tuberculosis, and if so, what type of tubercle bacillus was involved. In view of the importance of the national schemes for the control of tuberculous infection in bovines this work is naturally of very great importance, especially at the present time.

As I have reported on previous occasions, an extensive investigation to determine the cause and nature of scrapie in sheep was commenced in 1938; for this purpose there was purchased an experimental hirsel. Because of the long incubative period of scrapie the investigation has been necessarily a lengthy one, but it has afforded important information in respect of the nature of the cause and of the general pathology of the disease; it is expected that the first part of the investigation will be completed this year.

Some twelve years ago this Institute first showed that the disease of sheep and young cattle known as pine resulted from a mineral deficiency. It was at first believed that the mineral concerned was iron, but it was later found that the specific curative and preventive action of crude iron compounds was due to their containing as an impurity minute traces of another mineral, cobalt. It has been found by many farmers that the administration of cobalt has effected marked improvement in the health of their sheep and young stock, but it was obvious that a marked advance could be made if cobalt-deficient areas could be rendered cobalt-adequate. This we have found can be readily effected by dressing cobalt-deficient pastures with a phosphatic manure containing cobalt chloride in as low a quantity as 2 lb. per acre. By this means lambs have been found to gain markedly in weight. In one experiment it was found that lambs of less than four months of age which were running on pasture artificially rendered cobalt-adequate increased in weight by over 40 per cent. as compared with their fellows on the adjoining untreated pasture.

In conjunction with the Macaulay Institute for Soil Research surveys are being made on numerous farms in Ross-shire and Inverness-shire to determine the existence of cobalt-deficient soils and the incidence of cobalt pine. During the course of this work an interesting piece of evidence has emerged, namely, that on certain land the application of cobalt appears to bring about an increase in the pasture of another mineral, molybdenum. Molybdenum may prove toxic as has been shown in the so-called "teart" areas of Somersetshire; this matter is being actively followed up.

The problem of worm infestation in sheep and young cattle is one of great economic importance and recently there has been introduced a drug named "phenothiazine," which has been shown to be very valuable in the treatment of parasitic worm infestation. Definite knowledge of the dosage and of the most effective means of administration were lacking, and at the instance of the Agricultural Research Council, we were asked to collaborate with other bodies, including the Department of Natural History, Edinburgh University, in an experiment designed to provide accurate information concerning the drug and its actions. This has been completed.

Work is also proceeding on Johne's disease, pulpy kidney disease, the allergic inter-relationship between members of the group of microbes to which that of tuberculosis belongs and the chemical composition of clover and grass pasture plants, while much work of a diagnostic and advisory nature has been carried out for veterinary practitioners and stockowners.

Grass Sickness

From what I have said it will be realised that, despite war-time conditions, the loss of several skilled members of the staff, and the many calls upon the existing staff in respect of manifold war-time activities, the Association's efforts have not flagged, and that the

year's work has been a full one. There is, nevertheless, one other problem to which reference has to be made and which, indeed, has been for many years in the forefront of our programme. I mean grass sickness in horses.

As you know, the Institute, with the co-operation of a number of eminent scientific workers, has long been engaged on the investigation of grass sickness and there will shortly be published a somewhat compendious report setting out our present knowledge of the subject. That report will, I hope, convey to its readers some impression of the magnitude of the work which has been put into this research, but in spite of this all our efforts have resulted in negative answers.

It eventually became necessary to decide which of the different lines of research hitherto followed was that one most likely to yield a positive answer. After a careful review of all the evidence I have reached the opinion—it is, indeed it must be, only a tentative opinion, since it is, so far, unsupported by positive experimental evidence—that the cause of the disease will most likely be found in a living infective virus. That opinion, which was until recently only a personal one, has received the careful consideration and eventual support of the Scottish Board of Research in Veterinary Science, and unless confutative evidence arises, the investigation will proceed mainly along this line.

In view of recent correspondence in *The Scotsman* newspaper and particularly in view of an informative and helpful letter which appeared over the name of Major Brebner, I think that it is proper to say that at no time in my experience have funds been lacking for the prosecution of grass sickness research. There have been occasions when I represented the immediate need for large sums of money—running into thousands of pounds. These were immediately forthcoming. If the cause of grass sickness has not yet been demonstrated it has not been because of lack of financial support, and I would also add, nor because of lack of endeavour, which will be continued to the best of our ability.

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VITAMIN B DEFICIENCY AND THE SMALL INTESTINE

"It has been known for more than twenty years that deficiency of 'vitamin B' is associated with abnormal gastro-intestinal function," observes *The British Medical Journal* in a leading article (January 17th, 1942) which will also interest veterinary workers. "When vitamin B_1 was recognised as a separate component of the B complex a great deal of attention began to be paid to the state of the gastro-intestinal tract in beriberi and in experimental polyneuritis. In the human disease constipation is common, and animal experiments have demonstrated reduced tone and motility in stomach and intestine. It is these findings, inncidentally, which are responsible for yet one more addition to the already overwhelming list of 'cures' for constipation. More recently other members of the vitamin B complex have been implicated as essential for normal digestive activity. Much of this work is the result of careful radiological studies. It began with observations on the small intestine in cases of sprue (Pillai and Murthi,[1] Mackie[2]). In these and later studies, mainly by American workers, it was found that characteristic changes occurred in the small intestine in association with several diseases. Apart from tropical sprue, these were steatorrhoea, coeliac disease, ulcerative colitis, nephrosis, diabetes insipidus, and some cases of obstructive jaundice.[3] In early or mild disturbance of intestinal function motility and tonicity are increased, but later they are usually much diminished. Abnormal segmentation occurs, and there is often extensive alteration in the outline of the mucosal folds. As these radiological changes are most commonly found in the states of primary or secondary nutritive failure, they have come to be referred to as the 'deficiency pattern' of the small intestine. The histological changes are on the whole rather vague. There is frequently atrophy of the muscular wall and mucosa; oedema, round-cell infiltration and fibrosis may also be found. In one specimen, of which more will be said later, changes in the nervous elements were discovered.[4]

"The cause of this functional disability of the intestine is obscure. There is growing evidence that one or more components of the vitamin B complex are associated with its development. The 'deficiency pattern' has been produced in dogs on a diet lacking vitamin B, and was only completely cured by the administration of the whole complex.[5] The work of Martin and his colleagues[6] is of interest in this connection. Dogs in which mild constipation had been induced were fed with barium sulphate, together with one or more of the various components of the vitamin B group, and frequent radiographs were taken. These workers examined the effect not only of the better-known components of the group—vitamin B_1, nicotinic acid, riboflavin, choline, pyridoxine (vitamin B_6), and pantothenic acid—but also of inositol, which has lately been shown to be an essential dietary factor for mice. Only inositol and nicotinic acid were found to have an effect. The former increased peristalsis in both stomach and small intestine; nicotinic acid, on the other hand, decreased peristalsis and induced a state of repose. The authors suggest that the balance of these two factors might determine the motility of the gastro-intestinal tract. That the vitamin B complex is probably responsible for the 'deficiency pattern' in many of the patients showing intestinal abnormality is supported by therapeutic tests. Considerable recovery often follows the administration of liver extract.[7, 8] As might be expected from the disturbed alimentary condition, oral administration may not be effective and the extract may have to be given parenterally. The deficiency of the vitamin B may be primary—that is, caused by a low dietary intake—or it may be secondary—that is, conditioned by a defective absorption of the vitamin because of some other pathological change in the intestine. In other words, the intestinal changes not only may result from the deficiency but might also be its cause. In either case the alimentary lesion will lead to still less adequate absorption of essential dietary factors, and a vicious circle is established. Lepore and Golden[9] find that the 'deficiency pattern' in the small intestine is not confined to individuals with gross signs of diseases such as sprue. They describe a series of patients in whom the functional disorder of the intestine is accompanied by a series of symptoms and signs which, they claim, form a clear-cut syndrome due to deficiency of the vitamin B complex. There is usually a history of a diet rich in carbohydrate and poor in vitamin B. The patients complain of vague gastro-intestinal symptoms, anorexia, and asthenia. Objective findings include a flat glucose-tolerance curve, undoubtedly due to decrease in the absorptive powers of the intestine. The radiological findings were those of the 'deficiency pattern.' The oral administration of yeast extract was usually enough to produce rapid improvement: one patient who did not respond to this was cured by the parenteral administration of liver extract.

"Lack of vitamin B may thus be the cause of disturbed intestinal function. But the fact that exactly similar changes occur in such diverse conditions as jaundice and nephrosis leads one to think that there is a common defect in all these conditions which is the fundamental factor responsible for the observed derangement. Golden[10] suggests that this common factor may be a dysfunction of the intramural nervous system of the small intestine. In support of this hypothesis he cites the histological appearance of a biopsy specimen from the jejunum of one of his patients who afterwards recovered under treatment with vitamin B. The specimen showed degenerative changes of the cells in both the myenteric and submucosal plexuses. Some workers have reported similar changes in animals on diets deficient in vitamin B. As further evidence Golden mentions the radiological appearance of the alimentary canal in new-born infants, in whom nervous control is known to be incompletely developed. The small intestinne shows slower motility than that of the normal adult, mucosal folds cannot be seen, and segmentation is pronounced; in all these respects, therefore, the appearance is similar to the 'deficiency pattern' found in adult patients. Thus, according to Golden, the occurrence of the 'deficiency pattern' in several unrelated conditions depends on a common disturbance in function of the intramural nerves.

The most important practical point which emerges from these studies is that careful radiological examination of the small intestine may reveal the existence of unsuspected dietary deficiency. The impaired absorption powers of the intestine, revealed, for example, in the flattened glucose-tolerance curve, may readily bring about still further depletion of the organism of the vitamin B components necessary for adequate intestinal function. Thus a vicious circle may be established which can be broken only by the administration, parenterally if necessary, of large doses of the vitamin B complex."

(1) *Ind. J. Med.* (1931.) **12**. 116.
(2) Mackie, T. T. *Med. Clin. N. Amer.* (1933.) **17**. 165.
(3) Golden, R. *Radiol.* (1941.) **36**. 262.
(4) Crandall, L. A., Chesley, F. F., Hansen, D., and Dunbar, J. *Proc. Soc. exp. Biol., N.Y.* (1939.) **41**. 472.
(5) *Amer. J. dises. Dis.* (1941.) **8**. 290.
(6) Mackie, T. T., and Pound, R. E. *J. Amer. med. Ass.* (1935.) **104**. 613.
(7, 8) Mackie, T. T., Miller, D. K., and Rhoads, C. P. *Amer. J. trop. Med.* (1935.) **15**. 571.
(9) *J. Amer. med. Ass.* (1941.) **117**. 918.
(10) *J. Amer. med. Ass.* (1941.) **117**. 1013.

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A NEW LINE OF THERAPY AGAINST PATHOGENIC BACTERIA

The following annotation printed in *The Lancet* (September 4th, 1941) summarises well the history of the recent exploitation of a novel class of therapeutic agents, in the shape of the secretions of certain soil organisms and moulds which have a highly toxic action on some pathogenic bacteria. One of those agents, gramicidin, has already been tried, with encouraging results, in the treatment of bovine mastitis.

It has been known for a long time that some micro-organisms produce substances antagonistic towards pathogenic bacteria, but until lately few attempts have been made to isolate these substances and study their biological and chemical properties. Dubos[1] isolated from the soil a Gram-positive, spore-forming organism, later identified with *Bacillus brevis*, which produces powerful bactericidal agents. Originally it was believed that the bactericidal agent isolated from culture filtrates in crystalline form represented a single, homogenous compound which was termed gramicidin, but later it was found to consist of two bactericidal substances which were both obtained in crystalline state—gramicidin, especially effective against Gram-positive organisms, and tyrocidine, acting against Gram-negative organisms as well. *In vivo*, gramicidin was shown to protect mice against pneumococcal infections and against infections with group A and group C streptococci under certain conditions which did not differ essentially from the *in-vitro* conditions in which the substance had been shown to be bactericidal. Given by the intravenous route gramicidin is almost completely inactive against systemic infections.[2] It is highly toxic to animals. Tyrocidin is ineffective against bacterial infections *in vivo*; it is haemolytic.[2] Dubos and Hotchkiss found that a number of soil organisms produced substances similar to or identical with gramicidin and tyrocidin. Nothing is known yet about the chemical structure of these. J. C. Hoogerheide[3] described a crystalline antibacterial substance isolated from a soil organism, which according to its chemical and biological properties seems to be identical with gramicidin; it is now being tried out clinically in Philadelphia under the name H1; only local application is so far practicable because of its toxicity, but results are favourable. Also from the soil, Waksman and Woodruff[4] isolated a chromogenic actinomyces (*Actinomyces antibioticus*) from which they obtained two antibacterial substances, actinomycin A and B. Actinomycin A is bright red, inhibits the growth of many bacteria in great dilution, but is very toxic to laboratory animals. It is mainly bacteriostatic, whereas actinomycin B, which is colourless, is bactericidal. The chemical nature of these substances also has not been established.

The nature of the antibacterial substances, produced by *Pseudomones pyocyanea*, known for forty years since the work of Emmerich and Loeb[5] as "pyocanase," has been reinvestigated by Schoental.[6] She confirmed the bactericidal action of these substances on *Vibrio cholerae*, *Staphylococcus aureus* and many other organisms and showed that it was due to at least three fractions, the blue pigment pyocyanine, its breakdown product *a*-oxyphenazine, and a third colourless, chloroform-soluble principle, most easily extractable from old culture fluids. This last substance is bacteriolytic towards *V. cholerae*, thick suspensions of which are converted into a gel. In contrast to the original assumption of Emmerich and Loeb none of the antibacterial substances produced by *Ps. pyocyanea* are enzymes; therefore, the term pyocyanase does not seem to be justified for any of them. A good deal is known about the chemical nature of pyocyanine and *a*-oxyphenazine; their antibacterial action is probably much the same as that of other bactericidal dyes of similar chemical constitution. The chemical nature of the chloroform-soluble colourless bacteriolytic substance remains to be investigated. The antibacterial substances from actinomyces strains isolated by Waksman and Woodruff differ from another antibacterial agent obtained from actinomyces strains, actinomycetin, which forms the subject of many papers by Gratia and others.[7] This substance, which acts against a number of Gram-positive and Gram-negative bacteria, and lyses a number of them, is a protein and belongs most probably to the class of bacteriolytic enzymes of the lysozyme type.

Now Chain, Florey[8] and their colleagues have investigated the possibilities of penicillin, isolated from the mould *Penicillium notatum*. In the state of purity used in their biological and therapeutic experiments it is a yellow substance, easily soluble in water. It is not bactericidal, but even when very dilute (1: 2,000,000) it inhibits the growth of many pathogenic organisms, such as *Staph. aureus*, *Streptococcus pyogenes*, meningococcus, gonococcus, *Clostridium welchii*, *B. anthracis* and others. It differs from all the other antibacterial substances isolated from micro-organisms and, indeed from most antiseptics known, by its very low toxicity. Laboratory animals infected with *Cl. septique*, *Staph. aureus* and *Strep. pyogenes* were cured and the results of a number of clinical trials are promising. Here again we have yet to learn its chemical composition.

(1) Dubos, R. J. *Proc. Soc. exp. Biol. N.Y.* (1939.) **40**. 311; *J. exp. Med.* (1939.) **70**. 1. 289.
(2) *J. exp. Med.* (1941.) **73**. 629.
(3) *J. Franklin Inst.* (1940.) **229**. 677; *J. Bact.* (1940.) **40**. 325.
(4) Waksman, S. A., and Woodruff, H. B. *J. Bact.* (1940.) **40**. 581; *Proc. Soc. exp. Biol. N.Y.* (1940.) **45**. 609; *J. Bact.* (1941.) **41**. 32.
(5) *Zbl. Bakt.* (1899.) **26**. 237; (1941.) **31**. 1.
(6) Schoental, R. *Brit. J. exp. Path.* (1941.) **22**. 137.
(7) Gratia, A., and others. *C.R. Soc. Biol.* (1924.) **91**. 1442; (1925.) **97**. 461. 1125; **128**. 1172.
(8) *Lancet*. (1940.) **2**. 226; (1941.) **2**. 177.

CORRESPONDENCE

Letters to the Editor should reach the Office not later than by the first post on Monday morning for insertion in following Saturday's issue.

The views expressed in letters addressed to the Editor represent the personal view of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

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SCHEME FOR THE CONTROL OF THE DISEASES OF DAIRY CATTLE

Sir,—The explanatory note following Mr. Motton's letter in the issue of July 4th seems to have passed so far without comment. It was there stated that removal of foetal membranes retained after calving was not included in the Scheme for Control of Diseases of Dairy Cattle, but it is difficult to imagine on what grounds this decision was arrived at in the preliminary discussions. Although I am open to correction, I have always believed that retention of foetal membranes is usually the first sign of the presence of abortion in a herd and I further believe that at least 75 per cent. of the cases of retained membranes are due to abortion infection. After explaining to a client that abortion infection is the cause of a number of his cattle failing to "clean" it is somewhat difficult to give a convincing reason why the necessary treatment should not be included in the scheme, when an undertaking has been given to treat and control abortion. It is only natural that, after reading the explanatory leaflet, a farmer would assume that treatment would cover all phases of the disease.

Similarly, since retention of the foetal membranes can and often does lead to infertility, and an undertaking is given to treat and prevent infertility as far as possible, it is only reasonable for the farmer to assume that treatment should commence with the original cause, and should not be confined to the subsequent effect.

After the intensive preparations introducing the scheme to the farming community, the description of the first month's figures as "a promising start" seems a little exaggerated. If the figures were expressed as the percentage of the total number of herds in each county they would look very poor indeed, but unless the splitting of hairs over what should or should not be treated is definitely done away with I fear that figures for subsequent months will be very much worse and the scheme will soon prove as barren as the cattle it should treat.

Much has been written recently condemning destructive criticism, but these few remarks are not meant to be destructive in any way, and to prove that my argument is at least sincere, I may add that I have specifically included treatment for retained foetal membranes in those herds which I have taken on under the scheme.

Yours faithfully,

G. N. Shirley.

2, Wellington Villas,
Crewe, Cheshire.
July 25th, 1942.

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A "HAIR-BALL" PROBLEM

Sir,—On Sunday last, July 19th, 1942, I was called to assist a cow at the calving.

On my arrival I was shown a half-bred Friesian cow, five years of age, in good condition, and obviously ready for assistance.

This cow was served by the bull on August 10th last year, 1941, and the owner was worried about the possibility of the operation being performed to his satisfaction, owing to the abnormal length of time she had carried her calf.

The job was slow and tedious, notwithstanding which I managed to perform it and present the owner with a dead calf.

During the procedure I opened the thorax first of all, and having removed the heart and lungs, broke down the diaphragm, and proceeded to remove the stomachs and intestines, etc., of the calf. I happened to puncture the stomach and lying in the stomach I found approximately seven "hair-balls." They answered perfectly the description given to the hair-ball taken from the stomach of calves *post-mortem* by so many of us in the past.

The calf itself was, of course, abnormally large, being 5 ft. 10 in. from the root of the tail to the crown of the head, and had a girth of 29 in. Unfortunately I had no means of weighing the body.

On the Tuesday, the 21st, I attended the cow to remove the membranes, and during this operation I found a hard lump in the undeveloped horn of the uterus, and quite a few of the same "hair-balls," nearly a dozen of them, were floating about in the fluids and membranes of the developed uterine horn. On further examination, after having removed the membranes, I found that the hard lump referred to was composed of nine of these hair-balls rolled together.

I write to ask if any of your readers can give me any idea as to the source of these hair-balls. What caused them to be formed, and, above all, how did they get into the stomach of the unborn calf?

Yours faithfully,

G. A. Keatinge.

Church Street,
Portadown, N. Ireland.
July 23rd, 1942.